L6 Assessment 3 2024-25 MS

1.

Marking Instructions	AO	Marks	Typical Solution
Circles correct answer	AO1.1b	B1	$-\frac{2}{5}$
			Total 1 mark

2.

Marking Instructions	AO	Marks	Typical Solution
Circles correct answer	1.1b	B1	−0.1
			Total 1 mark

3.

Q	Marking Instructions	AO	Marks	Typical Solution
11(a)(i)	States correct radius CAO	AO1.2	B1	Radius $=\sqrt{5}$
(a)(ii)	States correct centre CAO	AO1.2	B1	*C* is (7, –2)
(b)	Finds gradient of the line through the points *P* and 'their' *C* (as found in part **(a)**) Condone one sign error	AO3.1a	M1	Gradient CP = $\frac{10-(-2)}{1-7}=-2$
	Correct tangent gradient obtained from 'their' *CP* gradient	AO3.1a	M1	So tangent gradient ¿ $\frac{1}{2}$
	Uses a correct form for the equation of a straight line with correct coordinates of *P* and 'their' tangent gradient	AO1.1a	M1	$y-10=\frac{1}{2}(x-1)$
	States correct final answer in required form ($ax+by+c=0$) FT from 'their' C found in part (a)	AO1.1b	A1F	$2y-20=x-1$ $x-2y+19=0$

(c)	Identifies QTC as a right-angled triangle PI	AO3.1a	M1	QTC is a right-angled triangle so we can use Pythagoras
	Finds QC or QC^2 FT 'their' C found in part **(a)**	AO1.1b	B1F	$QC^2 = (7 - 3)^2 + (-2-3)^2$
	Uses Pythagoras' theorem correctly for 'their' triangle	AO1.1a	M1	$4^2 + 5^2 = (\sqrt{5})^2 + QT^2$
	Correct evaluation of length of QT FT 'their' QC and 'their' radius found in part **(a)**	AO1.1b	A1F	$QT^2 = 36$ so $QT = 6$
	Total		**10**	

4.

8 (a)	$BC^2 = 4^2 + 6^2 - 2(4)(6)\cos(12)$ $\Rightarrow BC^2 = 5.0489...$ $\Rightarrow BC = \sqrt{5.0489...}$ $\Rightarrow BC = 2.246...$ (so distance between B and C is) <u>2.0</u> km (nearest 0.5 km)	M1 A1 cao [2]	Substitutes values correctly into the cosine rule to form equation in BC^2 NB allow any variable on the LHS, but... $x^2 = 4^2 + 6^2 - 2(4)(6)\cos(12)$ is M1 $x = 4^2 + 6^2 - 2(4)(6)\cos(12)$ is M0 <u>until we see them sqrt</u> because there is no evidence they are using the correct cosine rule Correct distance between the planes Units not necessary
8 (b)	$\frac{"2.246"}{\sin 12} = \frac{6}{\sin ABC} \Rightarrow \sin ABC = ...$ $\Rightarrow \sin ABC = \frac{6\sin 12}{"2.246"}$ Since ABC is obtuse, $ABC = 180 - \sin^{-1}\left(\frac{6\sin 12}{"2.246"}\right)$ $= 146.27...$ So $\theta = 180 - 146.27... =$ awrt <u>34</u>	M1 M1 A1 cao [3]	Uses correct sine rule to form equation involving angle ABC and re-arranges for $\sin ABC$ NB no marks if they find ACB until they involve ABC Complete method to find θ Correct value of θ to nearest degree
8 (b) ALT	$\cos ABC = \frac{4^2 + "2.246"^2 - 6^2}{2(4)("2.246")}$ $\Rightarrow \cos ABC = -0.8317...$ $\Rightarrow ABC = \cos^{-1}(-0.8317...) = 146.27...$ So $\theta = 180 - 146.27... =$ awrt <u>34</u>	M1 M1 A1 cao [3]	Uses correct cosine rule to form an equation involving angle ABC NB no marks if they find ACB until they involve ABC Complete method to find θ Correct value of θ to nearest degree

5.

	Marking Instructions	AO	Marks	Typical Solution
(a)	Rewrites given expression with a fractional power and negative power – at least one index form must be correct	AO1.1a	M1	$y = 6x^{\frac{3}{2}} + 32x^{-1}$
	Both terms correct	AO1.1b	A1	
	Differentiates 'their' rewritten expression – at least one term correct	AO1.1a	M1	$\frac{dy}{dx} = 6 \times \frac{3}{2} \times x^{\frac{1}{2}} - 32x^{-2}$ $= 9\sqrt{x} - \frac{32}{x^2}$
	Both terms correct for 'their' expression	AO1.1b	A1F	
(b)	Finds the equation of the tangent, a clear attempt must be seen	AO3.1a	M1	When $x = 4$,
	Evaluates 'their' $\frac{dy}{dx}$ (from part **(a)**) correctly (when $x = 4$)	AO1.1b	A1F	$\frac{dy}{dx} = 9 \times 2 - \frac{32}{16} = 16$ and
	Obtains correct y value (when $x = 4$)	AO1.1b	A1	$y = 6 \times 4 \times 2 + \frac{32}{4} = 56$
	Obtains correct form of the equation of a straight line using 'their' values for y and $\frac{dy}{dx}$	AO1.1b	A1F	Tangent: $y - 56 = 16(x - 4)$
	Deduces value required at x-axis is when y equals 0 (follow through from 'their' equation) Both coordinates needed, any form	AO2.2a	A1F	When $y = 0$, $x = 4 - \frac{56}{16} = 0.5$ (0.5,0)
				Total 9 marks

6.

Q	Marking instructions	AO	Marks	Typical solution
8(a)	Differentiates, at least one term correct.	1.1a	M1	$\frac{dy}{dx} = 3x^2 - 6 - \frac{9}{x^2}$
	Obtains correct derivative.	1.1b	A1	For stationary point $\frac{dy}{dx} = 0$ $3x^2 - 6 - \frac{9}{x^2} = 0$
	Sets correct derivative = 0 and rearranges to obtain given equation.	2.1	R1	$3x^4 - 6x^2 - 9 = 0$ $x^4 - 2x^2 - 3 = 0$
	Subtotal		**3**	

Q	Marking instructions	AO	Marks	Typical solution
8(b)	Factorises or solves using calculator. PI	1.1a	M1	$(x^2 - 3)(x^2 + 1) = 0$
	Obtains two correct factors or obtains two correct solutions. ACF	1.1b	A1	$(x^2 - 3) = 0$ gives stationary points at $\pm\sqrt{3}$
	Concludes that as there are only 2 solutions, there are only 2 stationary points. OE	2.2a	R1	$(x^2 + 1) = 0$ has no real solutions so there are only two stationary points
	Subtotal		**3**	

Q	Marking instructions	AO	Marks	Typical solution
8(c)	Differentiates their $\frac{dy}{dx}$ again, at least one of the two non-zero terms correct, or uses values to test the sign of $\frac{dy}{dx}$ close to their $\pm\sqrt{3}$ OE	1.1a	M1	$$\frac{d^2y}{dx^2} = 6x + \frac{18}{x^3}$$ At ($\sqrt{3}$, 0) $\frac{d^2y}{dx^2}$ is positive therefore this is a minimum point At ($-\sqrt{3}$, 0) $\frac{d^2y}{dx^2}$ is negative therefore this is a maximum point
	Makes consistent deduction about the nature of one of their stationary points from sign of their $\frac{d^2y}{dx^2}$ or the sign of $\frac{dy}{dx}$ close to their $\pm\sqrt{3}$	1.1a	M1	
	States correct coordinates for one stationary point. ACF	1.1b	B1	
	Obtains the correct exact coordinates of both stationary points, along with their correct natures (from correct $\frac{d^2y}{dx^2}$)	1.1b	A1	
	Subtotal		**4**	

Q	Marking instructions	AO	Marks	Typical solution
8(d)	Deduces $y = 0$	2.2a	B1	$y = 0$
	Subtotal		**1**	

	Question 8 Total		**11**	

7.

<table>
<tr><th>Marking Instructions</th><th>AO</th><th>Marks</th><th>Typical Solution</th></tr>
<tr><td>Uses negative reciprocal to obtain equation with correct gradient</td><td>AO3.1a</td><td>M1</td><td rowspan="4">$-4x + 5y = k$
$x = 1$
$\Rightarrow 5 + 4y = 17$
$\Rightarrow y = 3$
$k = -4 \times 1 + 5 \times 3 = 11$
$5y - 4x = 11$
$y = \frac{4}{5}x + \frac{11}{5}$</td></tr>
<tr><td>Obtains correct x coordinate of midpoint
Or obtains correct equations of lines through A and B perpendicular to AB
$5y - 4x = 31.5$ $5y - 4x = -9.5$
OE</td><td>AO1.1b</td><td>B1</td></tr>
<tr><td>Substitutes their mid-point value of x to obtain value of y coordinate of midpoint (not in terms of a or b)
Or
Finds a value for their $\frac{a+b}{2}$
Or
Finds k by adding correct equations of lines through A and B perpendicular to AB
Or equating intercepts.</td><td>AO1.1a</td><td>M1</td></tr>
<tr><td>Obtains correct equation ACF
Eg $y = \frac{4}{5}x + c$, $c = 2.2$
ISW once correct answer seen.</td><td>AO1.1b</td><td>A1</td></tr>
<tr><td colspan="4" align="right">Total 4 marks</td></tr>
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8.

(a) $y_D = 3 + 1 = 4$ or $y_C = 12 - 8 = 4$

Attempt at either y coordinate

M1

Area $ABCD = 3 \times 4 = 12$

A1

2

(b) (i) $x^3 - \frac{x^4}{4}$ $(+ C)$

Increase one power by 1

M1

One term correct unsimplified

A1

All correct unsimplified (condone no +C)

A1

3

(ii) Sub limits −1 and 2 into their (b)(i) ans

May use both −1, 0 and 0, 2 instead

M1

$[8 - 4] - \left[-1 - \frac{1}{4}\right] = 5\frac{1}{4}$

A1

Shaded area = "their" (rectangle− integral)

Alt method: difference of two integrals

M1

$= 12 - 5\frac{1}{4} = 6\frac{3}{4}$

***CSO**. Attempted M2, A2*

A1

4